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INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

Egypt: Movements of the Desert Locust (*Schistocerca gregaria*) (1).

(*A*) SINAI.

(1) North Sinai.

Early in May, 1930 survivors of the early hatching swarms of March attained their wings and by the middle of the month small groups of adults were to be found in most areas. The majority of these adult locusts were more inclined to the flaviventris phase than gregaria.

Lehfan and the Sinai Railway line from Kantara to El Arish have been invaded by many hopper bands. The last large hopper swarms descended on El Arish at the beginning of the month and was very successfully dealt with. Since that time only comparatively small swarms have been met. Some were reported from Magdaba & Kosseima while others were common in Kuntilla, Nekhl and Themed as far as Ras El Nijb.

In the desert region to the East of Ismailia, hoppers were seen on May 10th migrating towards the Suez Canal and on the same day some crossed the Canal swimming near Serapeum. This incident was reported on other occasions ; very few survived.

Further to the South in the Shatt Zone their line of march was to the N. and N. W. whence they were reported on May 12th.

Near the Frontiers our patrols assisted in fighting hoppers at W. Sobha on May 5 and near Khan Younes on the 15th.

On May 4 eggs were discovered in Hassana.

Most red locusts were destroyed soon after appearance, in few cases they formed small swarms and flew about but showed little desire to migrate.

On May 7 fliers reached W. Sudr el Heitan coming from the West but many arrived from the East.

A big swarm from W. Araba passed Ras el Nijb on May 17 and proceeded to the extreme S. W., another was reported on 25th from Kuntilla going to the same direction while many others were seen near the frontiers from Rafa to Kosseima.

From May 14 small parties of recently adult locusts began to cross the Suez Canal from E. to W. but they did not go far.

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* In this, as in the two next chapters, the countries are arranged in French alphabetical order.

(1) Communication from Mr. E. BALLARD, Chief Plant Pathologist, Plant Protection Section, Ministry of Agriculture, Cairo, Egypt, to the International Institute of Agriculture.

On May 18th some reached Suez from the West and were probably returning individuals from those which had gone to the West on 17th. None of these could be regarded as a swarm.

By the end of the months few localities round Nekhl remained to be dealt with. The North and Central Sinai was either clean or contained so few locusts that they were not worth destroying. Poison bran across the wadies proved most efficacious.

(2) South Sinai.

On April 26 and 27 red locusts appeared amongst the hoppers in Tur, Feiran & Berdess zones. Early next month they were found in many other infested areas. All were restless and continued to roam about. Prevailing winds played an important part in governing their line of flight which at this stage of their life is never very decided.

On May 27th and 29 locusts were reported by Arabs from some wadies bordering El Teh and Gebel Egma. Patrols were sent to inspect those unexplored regions. News already received from these parties do not show that locusts had been breeding there on a large scale.

About the same time red fliers and hoppers were seen in wadies near the Gulf of Akaba. Most probably the locusts in this case had arrived from W. Araba or the Arabian Desert after crossing that Gulf.

Hoppers were common everywhere near the Gulf of Suez Coast from El Shatt in the North to the wadies south of Tor. Only in few cases they formed large bands. They were reported from inland wadies near Garandal and Abu Zeneima while many localities lying to the East of Feiran as far as W. Dahab on Akaba Gulf were found infested but not to any great extent.

Some egg areas were discovered, the latest was on 13th, while on the 25th dead red locusts were found near the Sea Shore North of Tor. In S. Sinai the forces were ready for demobilisation to begin and the end of the campaign was in sight over the whole Peninsula.

(*B*) The Eastern Desert.

On May 13th red fliers were observed at W. Molaha flying westwards. The majority settled in the vicinity while the rest continued their flight. These might have come from Akaba via South Sinai as locusts were reported from Tor on the 12th going to the South West.

Four days later a very big swarm was reported from Hurgada. As already mentioned its origin was probably W. Araba in Transjordania. Our patrols destroyed an appreciable percentage of it in W. Belih and Qattar but some escaped and flew to the Nile valley.

During the latter half of May dense swarms were reported from Koseir coming from the E. and the S. E., all moving towards the S. W., while on the 23rd and 26th some were observed at W. Abrig and Said flying to the N. W. The Arabian Desert was the source of all these fliers where as we know breeding has been taking place in vast areas and the hoppers after reaching the winged stage crossed the Red Sea on their way South to the Sudan.

In the extreme north a small swarm came from the East on the 29 and reached Helouan.

Hatching has been general all along the western fringes of the desert while some were observed near the Cairo Suez Road.

(*C*) The Delta.

Hatching has been confined to the localities bordering the Desert in Qualiubia and Sharkia provinces and in the Southern part of Beheira. Gharbia and Dakahlia remained free while some hoppers were seen in two districts at Menoufia.

Hoppers were common in many localities near the western shore of the Suez Canal. Some arrived from the East.

Eggs were discovered in some places where laying was late.

On May 5 and 10th a few yellow locusts were seen in Beheira Province, being the remnants of the swarms which visited this locality last month.

Although some sexually immature fliers began to cross the Canal during the latter half of the month yet only a few reached the desert region near Sharkia and Qualiubia on May 17, 19 and 25.

(*D*) The Nile Valley.

Hoppers continued to appear in all districts as far as Qena while many egg areas were discovered.

An outbreak of *Euprepocnemis plorans* and *Epacromia strepens* was reported from Fayoum on May 20th and was mistaken for locusts.

Some of the red locusts reported from W. Melaha reached Tahta on May 13 while from the 17th big swarms began to visit Qena and Aswan on their way to the South West. All were coming from the Eastern Desert. Some changed their route and went to the North and N. West.

Except for few hoppers reported from Kharga Oasis the Southern Desert remained free the whole month.

(*E*) Control Work.

Destroying hoppers by bran bait and trenching was practised everywhere, the first gave excellent results and continued to be the cheapest and best means for fighting them.

In the desert regions the red swarms were combatted by flame-guns in the early morning, while hand picking was practised in some localities and the bait distributed on many occasions.

Early in the month labourers were sent from the Delta to certain localities in Sinai were the situation was grave at the time but by the end of the month arrangements were made to return them as the locality was clean.

Patrols are scouting at present many localities in Sinai and in the Eastern Desert.

(*F*) Locusts Destroyed.

No regular information has been received regarding the locusts destroyed except from S. Sinai and the Eastern Desert. The quantities reported from these two regions were :—

	Hoppers	Locusts
S. Sinai	15,000 sacks	638,315 kilos
E. Desert	000	43,110 »

These figures are approximate. The amount of hoppers and flying locusts destroyed is too immense for any reliable calculations to be made.

(*G*) Damage.

With the exception of few patches of millet eaten by the red fliers in Girga, Qena and Aswan provinces no damage has been reported from the different areas.

United States of America : Outstanding Entomological Features (1).

The present notes refer to May, 1930.

The usual spring damage by cutworms is being reported from the greater part of the country. The army-cutworm (*Chorizagrotis auxiliaris* Grote) outbreak in western and central Nebraska continued well into late April. Towards the end of May damage by the pale western cutworm (*Porosagrotis orthogonia* Morr.) was reported from parts of Montana.

Wireworms were reported as more or less troublesome from practically all parts of the country. In south-central and southern Illinois several thousand acres of corn had to be replanted on account of the depredations of these insects and in parts of South Dakota similar serious damage is being reported.

The recently discovered wireworm (*Heterodères laurentii* Guer.) was reported as pupating in late April and early May, pupation continuing throughout the month.

An epidemic of the flower thrips (*Frankliniella tritici* Fitch) is reported from Michigan, principally damaging fruit.

The Hessian-fly (*Phytophaga destructor* Say) situation has not changed materially since our last report. Unfavorable weather gave this insect a decided setback in western and central Illinois.

Mormon crickets (*Anabrus simplex* Hald.) are appearing in very threatening numbers in Sanders County, Mont., a county in which severe outbreaks occurred in 1926 and 1927.

The corn ear worm (*Heliothis obsoleta* Fab.) is now appearing quite commonly in southern Mississippi and southern and central Texas.

Throughout the East-Central States damage by sod webworms (*Crambus* spp.) to corn is quite general. Similar damage is also reported from Kentucky, Missouri, and Iowa.

A rather unusual outbreak of the southern corn leaf beetle (*Myochrous denticollis* Lec.) is reported from Indiana. In one field 90 per cent of the corn was eaten off below the ground by these beetles. Similar damage is being reported from Kentucky.

The pear midge (*Contarinia pyrivora* Riley) emerged in large numbers in the pear-growing portion of the Hudson River Valley, New York State, and will probably do serious damage where control measures are not applied.

During the early part of May practically all of the mature larvae of the oriental fruit moth (*Laspeyresia molesta* Busck) pupated and a large percentage of adults had emerged by the middle of the month. Twig injury was observed in western New York during the third week in the month, and toward the end of the month injury was appearing in Connecticut. In Maryland the peak of similar emergence occurred about the 1st of the month. In the Georgia fruit belt the infestation appears to be the lightest since the insect became established in the Fort Valley

(1) Communication from the official correspondent of the Institute, Mr. J. A. Hyslop, Senior Entomologist in Charge, Insect Pest Survey, Bureau of Entomology, United States Department of Agriculture, Washington, D. C.

district, and here it also appeared later than in previous years. In the East-Central States Illinois reported from 40 to 50 per cent of the peach twigs injured by May 10, in Pulaski County. The fruit moth has also been reported as appearing in appreciable numbers in Ohio, Indiana, Michigan, Kentucky, and the northern and north-central parts of Mississippi.

The first plum curculio (*Conotrachelus nenuphar* Hbst.) observed to leave peach drops in the Fort Valley district of Georgia was recorded on April 28, about two weeks later than usual. There will, therefore, probably by very little damage except to late varieties. In the East-Central States, particularly in the southern part, the plum curculio is seriously damaging apples. The stone fruits were practically a failure in this region, which may account for the unusual damage to apples.

The rusty plum aphid (*Hystroneura setariae* Thos.) was reported unusually abundant in the Fort Valley district of Georgia and in southern Mississippi. It was also recorded from Nebraska and Utah.

An infestation of the grape phylloxera (*Phylloxera vitifoliae* Fitch) was discovered in two San Gabriel vineyards in southern California. Every effort is being made to eradicate this insect.

Rather serious infestations of pecans by the pecan nut case bearer (*Acrobasis caryae* Grote) was reported from Albany, Ga., and from Stone and Jackson Counties, Miss.

The situation with regard to the citrophilus mealybug (*Pseudococcus gahani* Green) in southern California is more favorable than it has been any year since this insect became a major pest in Los Angeles County. Many properties recorded as infested last year are now being reported clean and only a very low percentage of the properties are being reported as heavily infested.

The California red scale (*Chrysomphalus aurantii* Mask.) is reported as being generally abundant throughout the lower Rio Grande Valley of Texas and present indications are that infestations will be severe.

The vegetable weevil (*Listroderes obliquus* Gyll.) is being reported from several localities in Mississippi, in some cases doing serious damage to tomato plants, turnips, and carrots.

The seed corn maggot (*Hylemyia cilicrura* Rond.) is reported as seriously damaging potato seed pieces and corn in Ohio, Indiana, Michigan, and Missouri and doing some damage in Iowa. It was also reported as destroying watermelon seeds in Utah and peas in Minnesota.

The Colorado potato beetle (*Leptinotarsa decemlineata* Say) appears to have been favored by the prolonged drought along the north Atlantic Seaboard. Reports of unusual abundance have been received from North Carolina to New York. On May 21 adults of this insect were collected in St. Johns County, Fla. This appears to be the first record of this insect as far south as the Hastings area in this State.

The cabbage aphid (*Brevicoryne brassicae* L.) is seriously abundant on seed kale in the Norfolk district of Virginia where it may reduce the crop by half.

The weevil *Tyloderma morbillosa* Lec. is very serious in a number of strawberry fields in western Washington. As high as 50 adults have been found on a single plant and the plants so infested are killed in about a week.

The first emergence of the Mexican bean beetle (*Epilachna corrupta* Muls.) was observed at Camden, Del., on May 6. In the Norfolk district of Virginia adults were observed in the field on the first of the month.

The pea aphid (*Illinoia pisi* Kalt.) has been worse on the Eastern Shore of Maryland than it has been for many years.

Heavy stripping of the early foliage of elm by *Calligrapha scalaris* Lec. is being reported in Webster, Nuckolls, and Furnas counties in Nebraska.

In the vicinity of Augusta, Me., the larch case bearer (*Coleophora laricella* Hbn.) has defoliated approximately one-fourth of the larch trees. Many of these trees have been killed by this insect in previous infestations.

A severe infestation of the spruce budworm (*Harmologa fumiferana* Clem.) in the Shoshone National Forest has been under way for three or four years.

The spruce needle miner (*Epinotia nanana* Treitsche) is reported as seriously affecting spruces in northern Illinois and southern Wisconsin.

Canna leaf rollers (*Calpodes ethlius* Cram. and *Geshna cannalis* Quaint.) are very heavily infesting commercial plantings of cannas in the southern part of Mississippi.

The Argentine ant (*Iridomyrmex humilis* Mayr) has been found in three municipal greenhouses in Baltimore, Md.

India : Control of *Uredo fici* in the Bombay Presidency (1).

Fig rust is an important disease of figs in the Bombay Presidency, and causes defoliation of plants if no control measures are adopted. In experiments conducted during the last two years, effective control of rust was obtained when the plants were dusted with sulphur which can pass through a sieve having 200 meshes to a square inch. Dustings at 22- and 30-day intervals caused no, or very slight, injury to leaves.

Dutch East Indies: A New Pest of Tea in Sumatra (2).

On an estate in Sumatra the tea was damaged by the larva of a Curculionid beetle. The larvae mine in the full grown leaves and destroy them. They are legless and yellow in colour, 5-6 mm. long. Pupation takes place in the soil. The beetles are closely allied with and belong perhaps to the genus *Rhynchites*. They are steely-blue coloured, and are covered with long white hairs.

Dr. LEEFMANS, who kindly furnished this information, thinks it probable that this pest originally lives on some foodplant in the jungle. Whether this pest will become of economic importance the future will show. At present an area of 10 acres is heavily infested.

Madagascar: The Locust Invasion and Control Organisation (3).

Progress of the Invasion. — The locust invasion of the Colony of Madagascar in 1923 was made the subject of a communication to the International Institute of Agriculture in 1926. This communication was inserted in the brochure published by the Institute entitled 'Etat actuel de l'organisation de la lutte contre les sauterelles dans divers pays. Résultats d'une enquête internationale' (Rome, 1926, p. 48-53). It contains an account of the locust control organisation in the Colony up to and including 1925.

In 1926 and 1927 the invasion continued to concern nearly the whole area of the Colony, exclusive of the east coast forest zone.

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(1) Communication from the official correspondent of the Institute, Dr. B. N. UPPAL, Plant Pathologist to Government, Bombay Presidency, Poona, India.

(2) Communication from the official correspondent of the Institute, Dr. C. J. J. VAN HALL, Baarn.

(3) Communication from the Gouvernement Général de Madagascar et Dépendances to the International Institute of Agriculture.

In 1928 a reduction in the intensity of the invasion became apparent in most parts of Madagascar ; gaps appeared in the locust swarms, which before had been practically uninterrupted, and the swarms became smaller.

In 1929 the invasion was still less intense and only isolated swarms came over the country. Certain districts in the south and centre of the island however had rather more serious swarms.

Locust Invasion of Madagascar in 1929.

Province	Subdivision	Date	Stage of development	Direction	
				Arrival	Departure
Vangaindrano		23-26 March	adults		N
		31 »	»	S	
		3 April	»		
		7 »	»		N
		8 »	»		E
		10 »	»		
Ambositra	Ambatofinandrahana	April	hoppers		
Betroka	Ihosy-Ivohibé	May	»	S	
Fianarantsoa	Ambalavao	»	»		
Antsirabé	West of the Province	May-July	hoppers (invasion slight)		
Tananarive	Arivonimamo	28 August	adults		
		September	»	W	S
	Arivonimamo	7 October	»		
	»	8 »	»	N-W	S
	»	12 »	»	local flights	
	»	14 »	»	S-W	N-E
	»	15 »	»	E	W
	Tananarive	14 »	»		W
		4 »	»	S-E	N-W
Marovoay	Ambato-Boeny	9 »	»	S	
	Ancazobé	7-10 »	»	N	S
Ambohidratrimo	»	End »	adults (laying)	local flights	
	»	November	hoppers		

Organisation and Methods of Locust Destruction. — Locust destruction in the Colony was regulated by the Decree of 5 October 1915 which remained in force until 24 March 1928, when it was modified by a Decree of the Governor General of Madagascar and its Dependencies.

The new organisation provides for local bodies in the Provinces which can launch a methodical attack on the locusts as soon as they appear, which is useful in Madagascar where certain regions are not easily reached from the centre. The local anti-locust bodies are supplied with control equipment, chiefly metal barriers. Stores of the metal barriers have been formed in the provincial cantons so that they may be ready to hand when needed.

The total length of barriers in the Colony at the beginning of 1930 reached 60 kilometres.

Barriers have been adopted as the principal method of destroying hoppers for the local bodies because the work in the Provinces is generally carried out under the supervision of native officials. For cases where the work is under the direction of Europeans the Colony possesses 100 knapsack sprayers and stores of arsenical salts.

During the whole invasion locust destruction has been actively carried out in the Colony. The conditions are far from easy under the conditions of Madagascar where the population is very sparse over the large prairies of the west and centre of the island, which are highly favourable for the multiplication of locusts. But the efforts of the local bodies have been so successful that the reports of the Provinces concerning locusts almost unanimously record the absence of damage or only very slight damage.

The barriers used by the local anti-locust bodies have given good results. The workers rapidly become familiar with their use and utilise them readily because of the saving they entail of the arduous work of trench digging and the increased results with less work.

Barriers are particularly effective on comparatively level land where the migrating swarms of hoppers keep to their direction, and the best position for the barriers can be foreseen so that the hoppers will steer towards them. In mountainous regions however there are certain difficulties in the system, which succeeds only if it is under the control of experienced officials.

Poisons have not been used on a large scale, but some experiments have been quite satisfactory.

Some experiments made in 1928 must be reported, combining the use of barriers and poison bait prepared with sodium arsenite and the crushed remains of hoppers. During the hot part of the day when the hoppers were on the move barriers were employed, then towards evening the captured insects were half crushed and soaked in a sodium arsenite solution. The bait thus prepared was spread where the swarm stopped to feed. The hoppers devoured the bait readily and large numbers were killed.

The conditions of the experiment were not such as to make it possible to determine the percentage of hoppers poisoned, but the results were sufficiently encouraging for the experiment to be repeated under more exact conditions. This method is specially interesting because of the difficulty in Madagascar of finding or conveying to the scene of work materials which will serve as vehicles for the poison for purposes of bait. The hoppers captured with the help of barriers are thus an economic material par excellence.

Research on Locusts. — The persistence of the locust invasion of 1923 and particularly the development it took in 1925 and 1926 have necessitated a thorough study of the conditions of life of the locusts in the Colony. At the end of 1926 a specialist was engaged to investigate the question and to direct the control work.

It has been established that the locust invasions always come from the south of the island. The swarms spread into the south-west and west of the Colony and from there penetrate to the centre and east coast.

The special study of the species with which Madagascar is concerned carried out in the Colony since 1926 and completed during the stay of the specialist in Paris and his visit to the Natural History Museum in London in 1929, has established that the locusts in Madagascar form a distinct group from those of the same species in Africa and must be separated from the latter as a sub-species : *Locusta migratoria capito* Sauss.

VARIOUS QUESTIONS

Dusting and steeping of cereal seeds *

Western Australia (1). — No comparative tests have been carried out in Western Australia as to the relative efficiency of various proprietary dusts for the prevention of cryptogamic diseases of cereals.

* Continued from No. 4.

(1) Communication from the official correspondent of the Institute, Mr. H. A. Pittman, Plant Pathologist, Department of Agriculture, Perth, Western Australia.

We have found that dry copper carbonate used at the rate of 2-3 ozs. per bushel of wheat gives excellent control of ' bunt ' in wheat caused by *Tilletia tritici* or *T. laevis*. No other dry dusts are used in Western Australia on a commercial scale for any cereal diseases.

For oat smuts (*Ustilago avenae* and *U. laevis*) we use formalin sprinkled on the grain at the rate of 1 pint to 35 gallons of water. One gallon is used to a bushel of grain and the grain is left covered with moistened bags for 6-8 hours after sprinkling. It is then spread out to dry and sown as soon as possible.

For covered smut of barley (*Ustilago hordei*) we use the same treatment as for the oat smuts. Good control is obtained as in the case of the oats.

For loose smut of barley (*Ustilago nuda*) formalin is used to kill any spores present on the outside of the grains. Only seed from clean crops is used wherever possible.

Loose smut of wheat is not treated for except occasionally where wheat is to be grown in a small ' seedraising ' plot, in which case Jensen's modified hot water treatment is adopted. If farmers' crops show extra much loose smut the simplest procedure is to get seed wheat from a Government Farm, as such wheat is always clean.

Canada (1). — The coating of the seed with dust fungicides for the control of the more common seed-borne smut diseases has been studied extensively in Canada by the Dominion Division of Botany, the undersigned officer being in charge of these investigations. The first experiments were carried out at the Dominion Laboratory of Plant Pathology, Saskatoon, Sask., in 1921 and have been continued without interruption at one or other of the Dominion Plant Pathological Laboratories situated in Western Canada. The use of copper carbonate as a dust fungicide has been particularly investigated following favourable reports of its use in Australia and the United States in controlling wheat bunt (*Tilletia*). Organic mercury compounds whether applied in liquid form or as a dust, have also received attention.

Copper carbonate dust was used in the earliest experiments for the control of bunt (*Tilletia caries* [D. C.] Tul. and *T. foetens* [Berk. and Curt.] Trel.) in common wheat (*Triticum aestivum* L.). When smutty seed was coated with an even film of the dust, copper carbonate effectively controlled bunt, although in comparison with the usual formalin treatment, copper carbonate was found to be not quite as effective. The formalin solution in general use in Canada is made by adding 1 part of commercial formalin (40 % formaldehyde in water) to 320 parts of water. The solution was applied either by immersing the seed in it followed by draining, or by sprinkling it with the same, turning it over and over until each grain was thoroughly wet. After either mode of treatment the seed was kept covered with sacks for four hours and then spread out to dry. The germination of seed treated with copper carbonate was equal to that of the untreated, while the germination of the seed treated with formalin was usually less and often irregular. The effect of this fungicide was particularly noticeable in germination trials in 1923. The soil used for these trials was apparently badly infected with soil fungi.

Whatever may have been the cause, the germination of both treated and untreated seed was reduced, but the germination of the seed treated with formalin

(1) Communication from Mr. I. L. CONNERS, forwarded by the official correspondent of the Institute, Mr. H. T. GÜSSOW, Dominion Botanist, Central Experimental Farm, Division of Botany, Department of Agriculture, Dominion of Canada, Ottawa, Can.

was severely affected, being only 23 per cent, as compared with 68 per cent for the untreated check.

Although preliminary experiments indicated that copper carbonate would control wheat bunt, the experiments had been very limited. Heald (1921, 1923) had shown that the amount of bunt that developed in the resulting crop was a direct mathematical function of the spore load, other factors being equal. Mackie and Briggs (1923) had further shown that copper carbonate was only effective when the spore load was not too heavy. Experiments in 1924 and 1925 confirmed these results. It was found that when the spore load was not heavier than 1 part of spores to 250 parts of seed by weight, bunt smut could be successfully controlled by copper carbonate. When the spore load was 1 to 100 or greater copper carbonate failed. Indeed any dust may be expected to fail at these higher spore loads for the greasy nature of the bunt spores permits the seed to carry a heavier load of spores than it can carry of the fungicide dust. Fungicides applied as dusts obviously tend to fail if the grain is carrying an unusual amount of dirt and dust as well as spores. Although a susceptible variety, such as Prelude, is more heavily infected by a given spore load than Marquis, somewhat more resistant, copper carbonate is about equally effective if the spore load is within the limit above indicated.

Copper carbonate is chemically a basic copper carbonate, of a greenish colour. To be satisfactory for dusting purposes it must be fine and fluffy. Two ounces of copper carbonate per bushel, when it is properly applied, will control bunt in common wheat. A machine is required for the proper application of copper carbonate to the seed. Best results have been obtained with a rotating drum with baffles on the interior for the agitation of the grain.

The brands of copper carbonate for dusting purposes are of two kinds, those having a coppper content of 20 per cent and those having 50 per cent. Invariably "50 per cent" brands of copper carbonate have given slightly better results than the "20 per cent" ones, but the difference has been so small that the latter has been invariably used.

More recently copper carbonate has been tested for bunt in durum wheat (*Triticum durum* Desf.). The occurrence of bunt in durum wheat differs in two important particulars from its manifestation in common wheat. In durum wheat the bunt balls are only broken up to a limited extent when the grain is threshed while in common wheat the balls are usually destroyed and the spores scattered over the grain. The caryopsis of durum wheat, unlike that of common wheat possesses only a limited "brush" and in consequence the spores, instead of being largely held in the "brush", are distributed over the seed. As the spores in the neighbourhood of the embryo are mainly concerned in the infection of the seedling a small spore load only is required to effectively inoculate the seed. Unpublished results show that in durum wheat it is essential that the bunt balls be removed if seed treatment is to be successful. This requirement was long ago established for common wheat. Their removal is most easily accomplished by the careful use of the fanning mill.

This preliminary precaution is the only method by which the grain may be prepared for treatment with dust fungicides. Experiments show further that 20 per cent copper carbonate was ineffective while a 50 per cent brand gave satisfactory control. Ceresan, an organic mercury dust was equally effective.

Copper carbonate is especially suitable for the control of the oat smut (*Ustilago avenae* [Pers.] Jens. and *U. laevis* [Kellerm. & Swing.] Magn.) in hull-less oats (*Avena nuda* L.). Experiments have shown repeatedly that copper carbonate

would practically eliminate covered smut from Liberty oats, a hull-less variety, from a cross between *A. sativa* L. and *A. nuda*, when the checks showed up to 75 per cent of the panicles smutted. Formalin is so injurious to this type of oats that it cannot be used. Three to four ounces of copper carbonate are required per bushel (*i.e.* 56 lbs.).

Copper carbonate has never given consistent results in the control of the oat smuts, in common oats (*A. sativa*). In general, if the check plots developed over 10 per cent smut the treatment was ineffective. Smuttox and Ceresan, however, have given very promising results. Smuttox is formalin mixed with infusorial earth to form a damp powder. The active principle of Ceresan is also said to be volatile, and this may explain the success of these dusts with common oat varieties.

The organic mercury compounds have not given entirely satisfactory results in Canada, in controlling the above mentioned smuts on wheat and oats. The most promising of the dusts tested have been " Du Pont 12 " and more recently Ceresan. Nevertheless Simmonds and Scott (1928) have shown that organic mercury compounds protect the seed materially from soil-borne pathogenic fungi while formalin and sulphur proved very injurious. Further study of organic mercury compounds as dust fungicides seems advisable.

Scotland (1). — Trials on the treatment of the seeds of cereals with disinfectants prior to sowing have been carried out in Scotland as follows :—

By the West of Scotland Agricultural College.

The College reports —

' For the most part our experiments have been with oats but some experiments with wheat have been undertaken. All our trials have borne very striking results in favour of seed disinfection. The most promising results have been obtained with the following:

Wet treatment.

Uspulun ½ % solution, Germisan ½ % solution.

Dry treatment.

Tillantin 2 ozs. to the bushel, Ceresan 2 ozs. to the bushel '.

By the North of Scotland College of Agriculture.

It is stated by the College that copper carbonate has been used against Loose Smut of Oats (*Ustilago avenae*) but without much success ; it is pointed out, however, that the mixing of the dust with the grain was not so good as might have been desired.

Straits Settlements and Federated Malay States (2). — Seed dusting with fungicides has not, up-to-date, been used in Malaya, and it does not seem likely there will be any development in this direction in the near future.

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(1) Communication from the Department of Agriculture for Scotland, Edinburgh, official correspondent of the Institute.

(2) Communication from the official correspondent of the Institute, Mr. A. Sharples, A. R. C. S., D. I. C., Government Mycologist, Department of Agriculture, Straits Settlements and Federated Malay States, Kuala Lumpur, Federated Malay States.

Guadeloupe (1). — Experiments in dusting or steeping of seeds as a measure for protection of cereals have not been undertaken at Guadeloupe.

Madagascar (2). — No comparative trial of treatment of seeds by dusting or steeping with different fungicides has been yet undertaken by our Phytopathological Laboratory, which has only recently been organised.

This treatment of seeds has not been employed on private plantations the greater part of which are in the hands of native growers.

Nigeria (3). — No control methods either of the nature of steeps or dusts have been carried out here. We have sporadic attacks on Guinea corn and millets by smuts such as *Sphacelotheca* spp. and *Ustilago* but thus far these have not been of such economic importance as to make treatment essential. I would also add that the illiterate peasant cultivator knows nothing of plant diseases or their control and such control methods as are carried out are done at the Agricultural Stations.

Netherlands (The) (4). — Dusting of seed is still seldom practised in the Netherlands ; recently however dusts have been more often used for treating seed of flax and beet.

Experiments have shown that products such as ' Tutan ', ' Tillantin ' and ' Abavit B ' give good results in controlling the *Fusarium* of rye when the infection is only light. When the infection is heavy however better success is obtained by steeping with ' Germisan ' or ' Uspulun Universal ' solutions.

Steeping is nearly always used to prevent smut of wheat and barley.

Our experience seems to indicate that good results may be obtained with the preceding methods of dusting but that they are not invariably effective.

The best that can be said for dusting is that if the wheat from the treated seed has not to be inspected standing in order to obtain a certificate the effects of dusting are sufficient, but that if the crop is to be inspected then steeping is preferable.

For steeping we always use a small quantity of liquid (2.5-3 litres per hectolitre) and turn the seed.

Dominican Republic (5). — The only cereal cultivated here on a large scale is maize, which is attacked by smut (*Ustilago zeae*) but to such a reduced extent (on an average 0.5 % or even less) that it is not considered necessary to continue to recommend the use of anticryptogamic seed treatments, nor therefore to experiment with their respective values or methods of application.

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(1) Communication from the official correspondent of the Institute, Mr. A. Buffon, Chef du Service de l Agriculture du Gouvernement de la Guadeloupe et Dépendances, Basse-Terre.

(2) Communication from the Chef du Service de l'Agriculture de Madagascar et Dépendances, Tananarive, official correspondent of the Institute.

(3) Communication from the official correspondent of the Institute, Mr. T. Laycock, Senior Mycologist, Agricultural Department, Ibadan, Nigeria.

(4) Communication from the Phytopathological Service of the Netherlands, Wageningen, official correspondent of the Institute.

(5) Communication from the official correspondent of the Institute, Dr. R. Ciferri, Fitopatólogo y Director de la Estación Nacional Agronómica y Colegio de Agricultura, Moca (República Dominicana).

Sierra Leone (1). — No trials have been made yet in this country of the control of plant diseases by seed-treatment, and practically no work has yet been carried out on the application of fungicides of any description. The use of any fungicide is at the moment rather outside the capabilities of native farmers.

Tanganyika Territory (2). — So far as I am aware the need for the treatment of wheat seed before sowing has not arisen in this country.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

France. — A Ministerial Decree of 15 April 1930 distributes among the 27 phytopathological divisions of France the horticultural and viticultural establishments, also those for export of agricultural products of plant origin, registered for 1930 on the inspection lists of the Plant Protection and Phytopathological Inspection Service. The Decree also appoints the delegates, assistant delegates and the controllers of this Service for 1930. (Ministère de l'Agriculture. Direction de l'Agriculture. *Bulletin de l'Office de Renseignements Agricoles*, Paris, 15 mai 1930, année 1930, nº 10, p. 149-152).

*** The phytosanitary regulation of the export of cherries with destination Germany and Great Britain in 1930, in view of the cherry fruit fly (*Rhagoletis cerasi*) is the same as the regulation for 1929 [see this *Bulletin*, Year III, 1929, No. 7, p. 103-104]. (*Ibid.*, p. 164-165).

India (3). — By Act No. XX of 1930 which received the assent of the Governor General on the 4th April 1930 and may be called the Destructive Insects and Pests (Amendment) Act, 1930, in clause (*b*) of section 2 of the Dectructive Insects and Pests Act, 1914, for the words " or land ", the words " land or air " shall be substituted.

Morocco (French Zone). — By Decree (undated) of the Directeur général de l'Agriculture, du Commerce et de la Colonisation, the employment of substances shown on Table *A* appended to the dahir of 2 December 1922, and in particular of strychnine and arsenical compounds, is authorised, *inter alia*, for the destruction of crows and rodents of the family of the *Muridae*. (*Feuille de Renseignements de la Direction Générale de l'Agriculture, du Commerce et de la Colonisation du Maroc*, Casablanca, 15 avril 1930, 11e année, nº 124, p. 71).

(1) Communication from the official correspondent of the Institute, Mr. F. C. Deighton, B. A., Mycologist, Agricultural Department, Njala, via Mano, Sierra Leone.

(2) Communication from the official correspondent of the Institute, Mr. Wm. Nowell, D. I. C., F. L. S., Director of the East African Agricultural Research Station (Kenya, Uganda, Tanganyika Territory, Zanzibar, Nyasaland, N. Rhodesia), Amani, via Tanga, Tanganyika Territory.

(3) Communication from the official correspondent of the Institute, Mr. T. Bainbrigge Fletcher, R. N., F. L. S., F. E. S., F. Z. S., Imperial Entomologist, Imperial Department of Agriculture in India, Pusa, Bihar, India.

* * * Another Decree of the Director (also undated) indicates the precautions that should be taken by persons employing arsenical compounds for agricultural purposes. (*Ibid.*, p. 71-72).

* * * A third Decree (undated) establishes that arsenical compounds intended for the destruction of parasites harmful to crops can only be delivered or employed for such use when mixed with denaturants in the following proportion : arsenical products soluble or insoluble : 1000 grammes ; colouring substance, intense, blue, green or black : 2 grammes. (*Ibid.*, p. 72).

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